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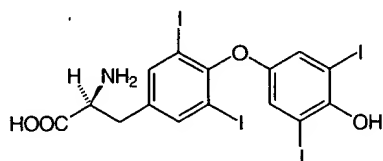
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tivity is lower than that of **triiodothyronine** (T_3). Its synthesis from L-tyrosyl residues of **thyroglobulin** means that the L-isomer is the naturally occurring form. Thyroxine is essential for normal metabolism and physical development. It stimulates the metabolic rate, causing increased oxygen consumption and heat production in tissues. Although in humans the plasma levels of T_4 are 20- to 50-fold higher than those of T_3 , T_4 is converted to T_3 in tissues and the effects are thought to be mediated by T_3 binding to receptors in the cell nucleus (chromatin fraction), leading to mRNA and protein synthesis. The normal range in human blood is 60–150 nmol L⁻¹ (total of bound and free), 9–26 pmol L⁻¹ (free). The chemical constitution of thyroxine was deduced by the British biochemist Sir Charles R. Harington (1897–1972), and confirmed by synthesis (1927).



thyroxine-binding globulin *abbr.*: TBG; a major thyroid hormone transport protein found in mammalian serum. It is synthesized in liver, and variations in its concentration in serum result in similar variations in the level of circulating thyroid hormones. Alterations in its affinity for thyroid hormone also affect circulating thyroid hormone levels, decreased affinity being accompanied by decreased serum concentration. In the human, this variation may result from non-thyroidal illness, the presence of drugs (salicylates and phenytoin block thyroid-binding sites), or genetic variation, many variants being known, and listed in the example from human: database code THBG_HUMAN, 415 amino acids (46.32 kDa).

Ti *symbol for* titanium.

tight coupling a term applied to mitochondrial function implying a high degree of efficiency in the yield of ATP (or other functional response) in relation to electron flow. The nearer the yield approaches the optimal value, the tighter the coupling is said to be. Tight coupling is obtained in isolated mitochondria only if gentle procedures, preserving membrane integrity, are employed during isolation. *See also* chemiosmotic coupling hypothesis, phosphorus:oxygen ratio.

tight junction or *zona occludens* (in vertebrate tissues) a belt-like region of very close contact between the plasma membranes of adjacent cells, such that the intercellular space is completely occluded. Tight junctions occur in epithelia and brain endothelia, and are effective barriers to the passage of water and solutes. *Compare* gap junction.

tight turn *see* beta turn.

time *symbol*: *t*; one of the seven SI base physical quantities, usually indicating duration or a precise moment. The SI base unit of time is the **second**.

time constant a characteristic time taken by a system or a process to respond to a perturbation.

time course a graph plot of a parameter (that changes with time) scaled on the ordinate and time scaled on the abscissa.

time-resolved fluorescence spectrometry a method in which a sample is irradiated using a laser delivering a short (sub-nanosecond) pulse of light, after which the exponential decay of fluorescence is measured using a photomultiplier. The sensitivity of detection must be at the single photon level ('single photon counting'), and fluorescence lifetimes as short as a few nanoseconds can be determined. However, a disadvantage of the technique is that many measurements over possibly several hours may be needed to obtain reliable and sufficient data. *See also* steady-state fluorescence anisotropy.

TIMP *abbr.* for tissue inhibitor of metalloproteases; any of a

group of proteins that inhibit metalloproteinases. An example is TIMP-1, also known as EPA (erythroid potentiating activity), a protein that mediates erythropoiesis. It forms complexes with enzymes such as collagenases, bringing about irreversible inactivation. Example (precursor) from human: database code TIM1_HUMAN, 207 amino acids (23.14 kDa). *See also* matrix metalloproteinase.

tintometer an apparatus formerly used for determining the colour of a solution by comparison with a graded colour scale.

Ti plasmid *abbr.* for tumour-inducing plasmid; any of a class of large conjugative plasmids found in the soil bacterium *Agrobacterium tumefaciens* and responsible for **crown-gall disease** of broad-leaved plants – a segment of the Ti plasmid, the **T-DNA**, is found in the genome of the tumour tissue of affected plants. With appropriate modifications the Ti plasmid can carry foreign DNA sequences of any desired kind into the genome of a susceptible plant.

Tiselius, Arne Wilhelm Kaurin (1902–71), Swedish protein chemist; Nobel Laureate in Chemistry (1948) 'for his research on electrophoresis and adsorption analysis, especially for his discoveries concerning the complex nature of the serum proteins'.

Tiselius apparatus an apparatus for performing **moving boundary electrophoresis** in which there is a U-tube with sliding joints. This enables the protein (or other) solution and the buffer to be placed in separate parts of the U-tube and sharp boundaries made between them when the parts are slid into position to complete the U-tube.

tissue any collection of cells that is organized to perform one or more specific function. *Compare* organ.

tissue culture 1 the technique or process of growing or maintaining tissue cells (**cell culture**), whole organs (**organ culture**), or parts of an organ, from an animal or plant, in artificial conditions. 2 any living material grown or maintained by such a technique.

tissue extract *an alternative name for* factor III; *see* **blood coagulation**.

tissue factor *abbr.*: TF; a transmembrane glycoprotein (eight motifs), also known as factor III, that initiates **blood coagulation** by forming a complex with factor VII or VIIA. The complex activates factors IX or X. Tissue factor plays a role in normal hemostasis by initiating cell-surface assembly and propagation of the coagulation protease cascade. Example from human (precursor): database code TF_HUMAN, 295 amino acids (33.03 kDa).

tissue grinder any device for disrupting tissue by a crushing or shearing action. The term may embrace devices ranging from a meat grinder (mincer), mechanical pestle and mortar, or mill, to the more precise **Potter–Elvehjem homogenizer** or the **Dounce homogenizer**.

tissue kallikrein *see* kallikrein.

titer *the US spelling of* titre.

titin or **connectin** a giant protein that forms a single molecule elastic filament extending from the M line to the Z line in the striated muscle sarcomere and is one of the largest polypeptides yet described. The sequence consists mainly of repeats of two types of approximately 100-amino-acid motifs, known as class I and class II that show homology to the fibronectin type-III domain and **immunoglobulin superfamily** C2 domain, respectively. There is also a domain characteristic of protein kinases near the C terminus. It is thought to play an important role in sarcomere alignment during muscle contraction. Example from human: database code HSTITIN, 4650 amino acids (521.48 kDa). *See also* twitchin.

titratable acidity 1 a measure of the acidity of a urine sample, expressed as the volume of 0.1 M NaOH required to neutralize, usually to a phenolphthalein endpoint, a 24-hour volume of urine. 2 a measure of the acidity of any solution, etc.

titrate 1 to add acid of known concentration to base of unknown concentration (or vice versa) until the point of equivalence is reached, from which can be determined the con-